

FARM FACTS

Produced by Saskatchewan Agriculture and Food

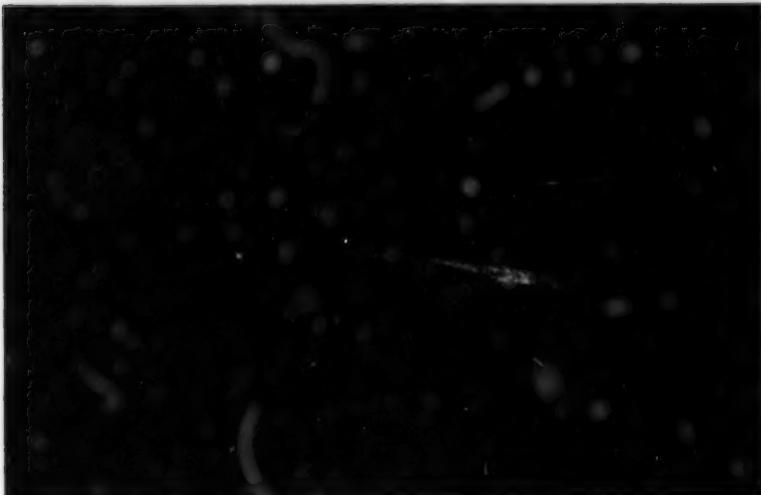
Introduction

Hemp (*Cannabis sativa*) has been cultivated for centuries as a source of fibre for rope, sail, and clothing. The seed was crushed as a source of oil, food and feed.

In Canada, hemp was used as a source of paper, fuel and fibre, until it was outlawed in 1937 under the Narcotics Control Act. Since March 1998, it can be produced in Canada under license with Health Canada. All producers, processors, researchers, contractors, and possessors of hemp must be licensed.

Approximately 14,000 ha (34,000 ac) of hemp was grown for grain and fibre production in Canada in 1999, while 40,000 ha (100,000 ac) of fibre hemp was grown in Europe in 1998.

Hemp is a tall (1.5-4 m or 5-13 ft) annual plant grown for grain and fibre. In well-structured soils, the plant can produce a 15-30 cm (6-12 in) tap root. In compacted or poorly drained soils, the plant produces more lateral fibrous roots. Leaves are palmate with 7-11 leaflets with serrated edges.



Hemp leaves

Hemp in Saskatchewan

The outer portion of the hemp stem contains strong and long bast fibres which provide the strength and quality attributed to the crop. The inner portion of the stem contains the hurd, which is used for paper and building materials.

The grain contains an edible oil used for cosmetics, fuel, and cooking. The oil is low in saturated fats and contains a mixture of omega-6 and omega-3 fatty acids as well as gamma linolenic acid (GLA), a nutraceutical compound.

Hemp is commonly dioecious (separate male and female plants). The male plants die after pollinating, causing uneven maturity and varying fibre quality. Plant breeders in Europe have developed monoecious (male and female flowers on the same plant) varieties which are more desirable. The monoecious female trait must be maintained by strict roguing during pedigree seed production.

Hemp varieties have been developed with very low THC levels (<0.3% narcotic: delta-9-



Female hemp plant on left, male plant on right

tetrahydrocannabinol). The bushel weight of hemp is 44 lbs with about 27,000 seeds per pound (60 seeds/g or 17g/1000 seeds).

Licensing

Hemp regulations are administered by Health Canada. Persons carrying out any activity involving hemp must be licensed. Possession of hemp plant parts or products without the appropriate license is a criminal offence.

Exceptions to this are mature stalks without leaves, branches or flowers, and non-viable seeds.

Licenses are issued for one calendar year for: cultivating, importing, exporting, processing, distributing, possessing, plant breeding, analyzing, and sampling hemp.

License applications, guides and further details are available from Health Canada, Ottawa. (See Additional Information)

For example, producers applying for a license to cultivate hemp require the following:

- Industrial Hemp License Application
- Schedule 1 License to Cultivate Industrial Hemp
- Schedule 6 Information on Officers, Directors and / or Partners (if corporation or partnership)
- Schedule 9 Authorization to Possess Industrial Hemp (if someone other than the person named in Schedule 1 is in possession)
- Global Positioning System (GPS) co-ordinates of the corners of the hemp production area; minimum four hectares (10 ac) per set of co-ordinates
- Map of hemp production area showing recognizable landmarks and roads
- Name of hemp variety to be grown
- Police security check - supplied by local police

Note: Cultivation of hemp is

not allowed within one km of a place frequented by people under 18 years of age (example: school). All seeding and harvesting equipment must be thoroughly cleaned before leaving the licensed hemp field. Records must be kept for a minimum of 2 years.

This information is provided as a guideline only. Contact Health Canada for detailed licensing requirements.

Market Opportunities

Markets for hemp are not well established. Interested producers are cautioned to investigate markets before undertaking production.

The hemp grain market is developing faster than the fibre market in Western Canada. A number of companies provided contracts for hemp grain production in 1998 and 1999. Some contractors were paying premiums for grain produced under certified organic conditions.

In 1998, the hemp grain price was \$1.10-\$1.30/kg (50-60¢/lb), while the certified organic hemp grain price was approximately \$1.50/kg (70¢/lb).

Adaptation

Hemp does well in a variety of soil types, but does not tolerate drought, flooding, saturated or saline soils. It is tolerant of

light spring frosts.

Production to date indicates hemp is best suited to areas with moderate rainfall and good soil fertility. Further testing is required to determine the area of Saskatchewan best suited to hemp production.

Maturity varies from 110 to 150 days depending on variety and date of seeding. Hemp is a short day plant; thus flowering of the plant is triggered by the shorter day lengths after June 21. Crops seeded in early spring may produce taller stalks and higher yields, but will not flower or mature much earlier than later seeded crops. Hemp should not be seeded after June 15.

Rotational Considerations

Hemp is a broadleaf oilseed and fibre crop. It is susceptible to similar disease and insect pests as other oilseed crops, such as canola, and should be grown in rotation with cereal and forage crops. Perennial weeds should be controlled in the year previous to hemp production, and some herbicide soil residues may cause crop injury (example: ODYSSEY®, PURSUIT®, ALLY®, AMBER®, ASSERT®, MUSTER®, PRISM®, ESCORT®).

Varieties

Hemp varieties have been developed in Europe with very low levels (<0.3%) of THC. Tall varieties are better suited to fibre production, while shorter varieties are better suited to grain production. Plant breeding is underway to develop hemp cultivars adapted to Saskatchewan conditions.

Commercial hemp cultivation licenses are only issued for pedigreed seed of varieties listed in the *Health Canada List of Approved Cultivars*. This list is available from the Health Canada website (See Additional Information).

Seeding

The recommended seeding rate for hemp grain production in Saskatchewan is approximately 22 kg/ha (20 lb/ac) or approximately 100-125 seeds/m². The recommended seeding rate for hemp fibre production is 66 kg/ha (60 lb/ac) or approximately 300-375 seeds/m². The higher seeding rate for fibre is due to the need for many fine stems with a higher percentage of fibre in the stems.

Hemp seed is oblong. Care must be taken if seeding is done by an air seeder. The seed is high in oil and if the air is set too high, some of the seeds will be crushed on the divider manifold.

The recommended seeding depth is 2-3 cm (¾-1½ in). Seed should be placed as shallow as possible, but into moist soil, with at least 2 cm (¾ in) of moist soil above the seed. Do not pack too tightly as excess soil compaction will reduce emergence.

Optimum soil temperature for fast germination and emergence is 8-10°C. Hemp should be seeded in Saskatchewan between May 1 and May 31. Research has shown that due to the photoperiod sensitivity (short day length requirement) of most hemp varieties, flowering and maturity will occur at relatively the same time regardless of seeding date. However, earlier seeding should result in taller plants with higher yields.

Fertilization

Information about fertilizer application is not available. Preliminary recommendations suggest producers fertilize hemp similar to an average wheat crop; such as 60-80 kg/ha (55-70 lb/ac) N, 33-40 kg/ha (30-35 lb/ac) P₂O₅, and potassium and sulphur where these nutrients are deficient.

Safe rates of fertilizer applied with the seed are not known, so it is recommended to keep rates of seed-placed phosphate and nitrogen fertilizer less than 17 kg/ha (15 lb/ac). Hemp

produced under organic conditions requires a well manured or composted field, such as following a perennial legume.

Weed Control

No herbicides are registered for use in hemp. Management of weeds is very important in the early stages of hemp crop development. A uniform crop stand that emerges ahead of weeds is important. Field selection, tillage, and good soil moisture-to-seed contact after seeding assist in quick crop emergence.

After the crop stand is established, hemp becomes a strong competitor to weeds. Wild buckwheat can be a major weed problem as the plant grows up the stem and produces seed at the same height as the hemp seed. Furthermore, wild buckwheat seed is difficult to separate from hemp seed.

Perennial weed control should be done in the year prior to seeding hemp.

Volunteer hemp control:

Hemp regulations require that all volunteer plants be eliminated. Several herbicides have activity on hemp, although none are registered for that use. Glyphosate® products and Gramoxone PDQ® would be suitable for pre-seeding applications. The use of in-crop broadleaf weed

herbicide with some residual activity may minimize volunteer problems.

Cultivation can be used to control hemp in fallow situations, but several passes may be necessary.

Extreme care must be taken to avoid contamination of grain of following crops with the seeds of volunteer hemp as this will lead to the rejection of shipments in some countries.

Disease Control

No fungicides are registered for use in hemp. Common seedling root rots and leaf spot diseases are likely to kill some hemp seedlings, especially in years with excess precipitation. Initial experience with hemp production indicates sclerotinia (*Sclerotinia sclerotiorum*) stem and root rot can be a significant problem.

Producers should avoid production of other susceptible crops such as canola, sunflower, pea, and dry bean in close rotations with hemp. *Botrytis* (*Botrytis cinerea*) grey mold can infect hemp flower and grain heads if high moisture conditions persist during flowering.

Insect Control

No insecticides are registered for use in hemp. Initial experience in Western Canada indicates that Bertha armyworm can be a significant pest in hemp. Grasshoppers

have caused significant defoliation in Alberta research plots. Cutworms and European corn borer have been reported on hemp. Sucking insects, such as stink bugs and lygus plant bugs, can cause seed yield reduction and could spread disease.

Other Concerns

Black birds have caused significant grain loss to mature hemp plants in areas near lakes and sloughs. Wind and hail damage can also be a problem in tall crops due to bent and broken stems. Some growers report the removal of individual hemp plants by inquisitive persons.

Possession of immature hemp plants without a license is illegal.

THC Sampling and Analysis

As part of the license requirements for growing hemp, producers must provide proof that their hemp crop has a THC level of less than 0.3 %. This is done by hiring the services of a person approved by Health Canada as a hemp sampler. A list of approved samplers is available from the Health Canada website (See Additional Information).

The sampler must follow the Health Canada guidelines outlined in the *Industrial Hemp Technical Manual* to collect samples, dry them and submit

the samples to an approved laboratory for analysis. The laboratory analysis determines the level of THC found in the crop sample and provides a report to the grower. The form for *Reporting of results of Delta-9 THC testing of Industrial Hemp* is also available from the Health Canada website.

A copy of the report must be submitted to Health Canada to be in compliance with the cultivation license. The grower must pay for both the sampling and laboratory analysis.

Harvesting

Fibre: Hemp grown for fibre should be harvested at early to mid flowering stage utilizing specialized equipment.

Contracting companies will advise growers regarding the best approach for harvesting fibre crops.

Grain: Some growers of grain hemp report success with swathing the crop as high as possible (cut the top portion of the crop containing the grain) and allowing the cut material to fall through the tall stubble. Swathing occurs just before grain maturity when the grain is at approximately 30% moisture. A second pass cuts the stubble at the height just above the windrow containing the grain. The grain is combined and the straw is baled in separate operations.

Most growers report success by straight cutting the crop as soon as shattering begins. This often occurs when the grain is at 21-28% moisture and the crop is still quite green. Initial experience indicates that waiting for the crop to ripen past this stage increases the risk of fibres wrapping around moving combine parts.

Growers report that crops over 2.5 m (8 ft) in height are very difficult to harvest. The header should be operated as high as possible to minimize the amount of stalks entering the combine. Overloading the combine should be avoided to reduce wrapping. Do not attempt to use the straw chopper due to fibre wrapping. Cylinder speed should be slowed to approximately 350 rpm and a slow ground speed is required. Seed dehulling in the combine should be avoided to reduce spoilage during storage.

Combine fires are a risk due to fibres wrapping around moving parts and fine dust igniting on hot surfaces. It is important to frequently monitor moving parts for wrapped fibre and keep hot engine surfaces clean.

The remaining stalks can be cut with a narrow swather or haybine, baled, and stored for potential sale as a source of low quality hemp fibre.

Grain yields have varied from zero in drought conditions to

over 1,200 kg/ha (1,100 lb/ac) in south-central Saskatchewan in 1999. Average grain yields in Saskatchewan are expected to be 350-550 kg/ha (300-500 lb/ac).

Hemp regulations require that all harvesting equipment be thoroughly cleaned before leaving the licensed hemp field.

Storage and Handling

Hemp regulations require the crop to be stored in a secure and suitable location.

Hemp is an oilseed crop and must be stored in a similar method to other oilseeds to avoid spoilage. Harvested grain may be as high as 28% moisture, and must be dried to <10% moisture for safe storage.

Drying using aeration fans should begin immediately after harvest. Once aeration commences, the fan should not be turned off until the grain is dry. Hemp grain dries relatively easily, provided the sample is free of green weed seeds and plant material, and darkens as it dries. The use of supplemental heat drying has not been tested and maximum drying temperatures are not known at this time.

A hemp moisture conversion chart for moisture meters is now available from the Canadian Grain Commission.

The following procedure can also be used to determine seed moisture content:

Weigh 100 g of seed and place in microwave for 30-second intervals. Weigh the seeds between each interval. Repeat until the seed weight becomes constant after three intervals.

Per cent seed moisture content equals
$\frac{100 \text{ g} - \text{weight of seed after drying (g)}}{\text{weight of seed after drying (g)}} \times 100$

Grain augers should be operated full and at slow speeds to reduce dehulling and splitting of seed. Hemp grain must be cleaned to food processing standards. Of concern are seeds with floral bracts still attached and flower and leaf parts remaining in the sample, as they can contain higher levels of THC. THC contamination of oil to levels above legal limits could lead to rejection of the product.

Mature hemp seeds have dark markings. Frozen or immature seeds have a colourless seed coat and must be removed in the cleaning process and destroyed.

Retting of Stalks

The process of beginning the separation of the bast fibres from the hurd in hemp stalks is called retting. Retting can be done in the field using moisture and sun or in tanks with treatments of water or chemicals.

Field retting in Saskatchewan has not been proven reliable due to dry environmental conditions after harvest. Industrial processes using water or chemicals to ret hemp stalks in an environmentally acceptable manner have not been developed.

Economics of Production

Cost of production and expected returns in Saskatchewan conditions have not been calculated. Estimates have been prepared by Manitoba Agriculture and are available on the Manitoba Agriculture website. (See Additional Information)

Additional Information

Health Canada:
Industrial Hemp Regulation Program
Office of Controlled Substances, Therapeutic Products Program
Health Protection Branch
Address Locator: 3618B
Ottawa, ON, Canada, K1A 1B9
Phone: (613) 954-6524
Fax: (613) 941-5360
Website: www.hc-sc.gc.ca/hpb-dgps/therapeut/htmleng/hemp.html

Saskatchewan Agriculture and Food
- Rural Service Centres
- Website: www.agr.gov.sk.ca/

Saskatchewan Hemp Association
Box 24007, Regina, SK.
S4P 4J8
306 757-4367
Fax: 306 757-4367
Email: saskhemp@sk.sympatico.ca
- Website: <http://paridss.usask.ca/specialcrop/commodity/hemp/about.html>

Manitoba Agriculture
- Website: www.gov.mb.ca/agriculture/programs/

Ontario Ministry of Agriculture, Food and Rural Affairs
- Website: www.gov.on.ca/OMAFRA/english/ag.html

Alberta Agriculture, Food and Rural Development
- Website: www.agric.gov.ab.ca/index.html

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